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# PORTABLE ELECTRONIC AIR COMPRESSOR

## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates to an electronic air compressor, and  
5 more particularly to an electronic air compressor that is made portable, thereby  
facilitating the user carrying the air compressor.

### 2. Description of the Related Art

A conventional air compressor comprises a motor which is operated  
to drive a crank shaft which drives a piston to move reciprocatingly so as to  
10 compress the air, and an air pipe for draining the compressed air outward. The  
pneumatic tool, such as a pneumatic nailer, is connected to the air pipe, so that  
the pneumatic tool is operated by the compressed air drained from the air pipe  
of the air compressor. The pneumatic nailer can eject the nail outward by the  
compressed air drained from the air compressor.

15 However, the conventional air compressor has a larger volume, so  
that the conventional air compressor occupies a larger space. In addition, the  
conventional air compressor is not portable, thereby causing inconvenience to  
the user in carrying and transporting the conventional air compressor. Further,  
the conventional air compressor uses an alternating current (AC) power supply  
20 to provide the electric power, so that the conventional air compressor is only  
available for a fixed place or position, thereby decreasing the versatility of the  
conventional air compressor.

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On the other hand, the conventional air compressor includes a pressure switch to detect the pressure contained in the air tank. When the pressure contained in the air tank reaches the upper limit, the pressure of the compressed air contained in the air tank pushes an elastic urging member in the pressure switch to close the pressure switch, so that the motor stops operating. When the pressure contained in the air tank is smaller than the upper limit, the elastic urging member of the pressure switch is returned to the original position by its restoring force to open the pressure switch, so that the motor proceeds to operate. However, the elastic urging member of the pressure switch produces elastic fatigue and is easily worn out during a long-term utilization, so that the compressed air produced by the piston is pushed into the air tank successively, and the air tank is easily broken due to an excessive pressure.

### **SUMMARY OF THE INVENTION**

The primary objective of the present invention is to provide a portable electronic air compressor, wherein the volume of the main body of the air compressor is greatly reduced by provision of the direct current air supply, the miniature motor, the reduction device and the control circuit, so that the air compressor occupies a smaller space.

Another objective of the present invention is to provide a portable electronic air compressor, wherein the air compressor is made portable, thereby facilitating the user carrying the air compressor.

A further objective of the present invention is to provide a portable electronic air compressor, wherein the control circuit is used to exactly detect the pressure contained in the air storage device and to control operation of the motor according to the detected pressure values of the air storage device.

5           A further objective of the present invention is to provide a portable electronic air compressor, wherein the control circuit includes a first pressure detection unit and a second pressure detection unit to doubly detect the pressure contained in the air storage device so as to assure the safety of the air storage device.

10           A further objective of the present invention is to provide a portable electronic air compressor, wherein the air compressor is provided with the direct current air supply, so that the air compressor is available for any place and position, thereby enhancing the versatility of the air compressor.

          A further objective of the present invention is to provide a portable  
15   electronic air compressor, wherein the air compressor is provided with the direct current air supply, so that the air compressor is available for any place and position, thereby enhancing the versatility of the air compressor.

          A further objective of the present invention is to provide a portable electronic air compressor, wherein the reduction device includes a drive gear  
20   having a smaller tooth number to drive the driven gear having a greater tooth number to enhance the operation torque of the piston, so as to produce the compressed air required for operation of the pneumatic tool.

A further objective of the present invention is to provide a portable electronic air compressor, wherein the pressure regulating device is used to regulate the pressure contained in the air storage device to prevent the air storage device from being broken due to an excessive pressure.

5 In accordance with the present invention, there is provided an air compressor, comprising a main body including:

an air storage device;

an actuating device connected to the air storage device to produce a compressed air and to push the compressed air into the air storage device;

10 a reduction device connected to the actuating device to produce a predetermined torque to operate the actuating device;

a motor connected to the reduction device to operate the reduction device;

a control circuit connected to the motor and the air storage device to  
15 detect a pressure contained in the air storage device and to control operation of the motor according to the detected pressure of the air storage device; and

a direct current air supply connected to the control circuit to supply an electric power to the control circuit.

Further benefits and advantages of the present invention will become  
20 apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 is a perspective view of a portable electronic air compressor in accordance with the preferred embodiment of the present invention;

Fig. 2 is a partially perspective view of the portable electronic air compressor as shown in Fig. 1;

5 Fig. 3 is a plan view of the portable electronic air compressor as shown in Fig. 1;

Fig. 4 is a plan cross-sectional view of the portable electronic air compressor as shown in Fig. 1;

Fig. 5 is a circuit layout of a control circuit of the portable electronic  
10 air compressor as shown in Fig. 1; and

Fig. 6 is a perspective view of a portable electronic air compressor in accordance with another embodiment of the present invention.

### **DETAILED DESCRIPTION OF THE INVENTION**

Referring to the drawings and initially to Figs. 1-5, a portable  
15 electronic air compressor in accordance with the preferred embodiment of the present invention comprises a housing 10, and a main body 20 mounted in the housing 10.

The housing 10 includes a base 11 for supporting the main body 20, and a cover 12 pivotally mounted on the base 11 to encompass the main body  
20 20.

The main body 20 includes a miniature motor 30, a reduction device 40 mounted on the motor 30 and including a drive gear 41 mounted on and

rotated by a rotation shaft 32 of the motor 30 and a driven gear 42 meshing with the drive gear 41, an actuating device 50 mounted on the reduction device 40 and including a crank shaft 51 mounted on and driven by the driven gear 42 of the reduction device 40 and a piston 52 mounted on and driven by the crank shaft 51, an air storage device 60 connected to the piston 52, an electronic control circuit 70 connected to the motor 30 for driving the motor 30 to rotate, and a direct current (DC) air supply 72 connected to the control circuit 70 to supply an electric power to the control circuit 70. The driven gear 42 of the reduction device 40 has a tooth number greater than that of the drive gear 41 of the reduction device 40.

In such a manner, when the piston 52 is moved to the downward stroke, the air inlet (not shown) is opened to draw the air inward, and when the piston 52 is moved to the upward stroke, the air inlet is closed. At this time, the piston 52 is moved upward to compress the air, and the compressed air is introduced into and stored in the air storage device 60. The air storage device 60 is connected to an air outlet pipe 61 to introduce the compressed air at a high pressure outward for use.

The total output power of the air compressor is decreased due to the direct current (DC) air supply 72. Thus, the reduction device 40 includes a drive gear 41 having a smaller tooth number to drive the driven gear 42 having a greater tooth number, to enhance the operation torque of the piston 52, so as

to produce the compressed air required for operation of the pneumatic tool (not shown).

In addition, the compressed air of different pressure is required for the pneumatic tools of different kinds. Thus, the main body 20 further includes  
5 a pressure regulating device 80 mounted between an air inlet pipe 62 of the main body 20 and the piston 52 to regulate the pressure contained in the air storage device 60 to prevent the air storage device 60 from being broken due to an excessive pressure.

Further, when the compressed air is directly drained outward from  
10 the air outlet pipe 61, the pneumatic tool cannot be operated smoothly due to the uneven pressure of the compressed air. Thus, the air storage device 60 is used to stabilize the pressure of the compressed air, so that the pneumatic tool can be operated smoothly.

As shown in Fig. 5, the control circuit 70 is used to detect the  
15 pressure contained in the air storage device 60 and to control operation of the motor 30 according to the detected pressure values of the air storage device 60.

In practice, after the switch 720 of the direct current air supply 72 is triggered, the control circuit 70 includes a first pressure detection unit 73 to detect the pressure contained in the air storage device 60. When the pressure  
20 contained in the air storage device 60 is smaller than 60psi, the motor 30 is operated to drive the piston 52 to produce the compressed air having a predetermined pressure. When the pressure contained in the air storage device

60 is greater than 140psi, the motor 30 stops operating, and a normal lamp 75 of the control circuit 70 lights to indicate the normal state.

In addition, the control circuit 70 further includes a second pressure detection unit 74 to detect the pressure contained in the air storage device 60.

5 When the pressure contained in the air storage device 60 is greater than 160psi, an over-pressure warning lamp 76 of the control circuit 70 lights to warn the user that the pressure contained in the air storage device 60 is too large, so that the user can operate the pressure regulating device 80 to regulate the pressure contained in the air storage device 60 so as to release the pressure manually  
10 until the pressure contained in the air storage device 60 achieves the safety value. After the second pressure detection unit 74 have detected the pressure contained in the air storage device 60 more than three times, the pressure contained in the air storage device 60 is still greater than 160psi, the control circuit 70 will lock the air compressor automatically, so that the air compressor  
15 stops operating. At this time, a locking lamp 77 of the control circuit 70 lights to indicate the locked state. Thus, the air compressor proceeds to operate after the user releases the pressure manually so as to protect the user's safety.

On the other hand, the control circuit 70 further includes a voltage detection unit 78 to detect the electric power of the direct current air supply 72.

20 When the voltage detection unit 78 detects that the voltage of the direct current air supply 72 is smaller than a predetermined voltage, an indication lamp 79 of



the control circuit 70 lights to notify the user to replace the direct current air supply 72.

As shown in Fig. 6, the air compressor further comprises a handle 90 mounted on the base 11 of the housing 10, so that the air compressor is  
5 portable.

Accordingly, the volume of the main body 20 of the air compressor is greatly reduced by provision of the direct current air supply 72, the miniature motor 30, the reduction device 40 and the control circuit 70, so that the air compressor occupies a smaller space. In addition, the air compressor is made  
10 portable, thereby facilitating the user carrying the air compressor. Further, the control circuit 70 is used to exactly detect the pressure contained in the air storage device 60 and to control operation of the motor 30 according to the detected pressure values of the air storage device 60. Further, the control circuit 70 includes a first pressure detection unit 73 and a second pressure  
15 detection unit 74 to doubly detect the pressure contained in the air storage device 60 so as to assure the safety of the air storage device 60. Further, the air compressor is provided with the direct current air supply 72, so that the air compressor is available for any place and position, thereby enhancing the versatility of the air compressor. Further, the reduction device includes a drive  
20 gear having a smaller tooth number to drive the driven gear having a greater tooth number to enhance the operation torque of the piston, so as to produce the compressed air required for operation of the pneumatic tool. Further, the

pressure regulating device is used to regulate the pressure contained in the air storage device to prevent the air storage device from being broken due to an excessive pressure.

Although the invention has been explained in relation to its preferred  
5 embodiment(s) as mentioned above, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the present invention. It is, therefore, contemplated that the appended claim or claims will cover such modifications and variations that fall within the true scope of the invention.